



Understanding and Upgrading Your Collection Preservation Environment

Welcome!

The webinar will begin at 10:00 a.m. CT.

While you wait:

1. Download PDF of the webinar slides and handouts under the "Handouts" tab of your control bar.
2. Confirm that your speakers are turned on and your audio is working by doing a sound check in the "Audio" tab of the control bar. Having problems? Exit and restart the webinar or switch to "phone call" for a phone number and access code to hear the audio through your telephone.

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The Museum Services Program provides support, resources, and training to museums in Texas.

- Consultations
- Webinars and workshops
- Resources

www.thc.texas.gov/museum-services

On our webpage:

- Webinars
- Workshops
- Grants and Fundraising
- Helpful Resources
- Connect and Learn

Laura Casey

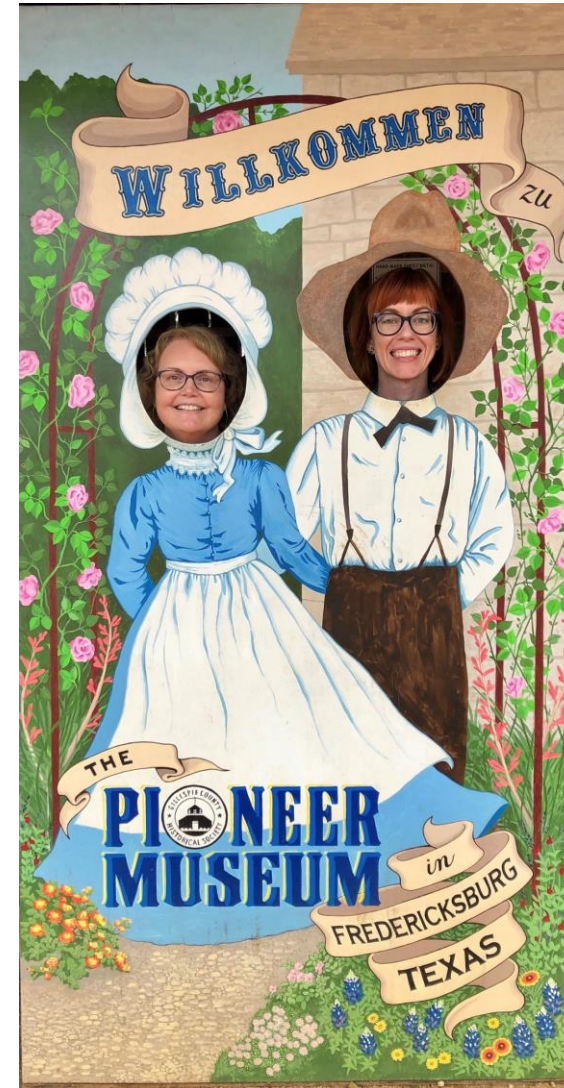
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Upcoming Free Museum Services Webinars

www.thc.texas.gov/museumwebinars

Values-Based Fundraising

- Thursday, June 16, 10:00 a.m. CT

Preserving History Through Podcasting

- Thursday, June 23, 10:00 a.m. CT

Upcoming Free Webinars from Other Orgs

www.thc.texas.gov/museumconnections

- *Event Preparedness: Active Shooters and Hostile Activity at Your Venues*, June 8, 1:00 p.m. CT, Lyrasis
- *Engaging Pro Bono and Skills-Based Volunteers*, June 8, 1:00 p.m. CT, VolunteerMatch
- *Mapping Museum Worker Overload*, June 9, 12:45 p.m. CT, Museum Human
- *How to Work with General Counsel*, June 10, 11:00 a.m. CT, OCEAN
- *Introduction to Creating and Using Historic Issues Decision Guides*, June 14, 1:00 p.m. CT, NIF
- *How to Incorporate Preservation Training into Your Construction Project*, June 14, 2:30 p.m. CT, PLF
- *Difficult History and Digital Collections*, June 15, 12:00 p.m. CT, Indiana Memory DPLA
- *Rethinking Your Open Hours*, June 15, 6:00 p.m. CT, Ohio Local History Alliance
- *The Time is Now: Restorative History and Racial Justice in America*, June 16, 9:00 a.m. CT, ICSC
- *Rights Reversion and Termination of Transfer*, June 17, 11:00 a.m. CT, OCEAN
- *Navigating the Nonprofit Workforce Crisis*, June 23, 1:00 p.m. CT, Blue Avocado
- *Writing Grants for Audio Preservation and Reformatting*, June 28, 11:30 a.m. CT, NEDCC
- *Summer Federal Advocacy Update*, June 28, 2:00 p.m. CT, Preservation Leadership Forum

Jimmy Hensel and John Stevenson



Understanding and Upgrading Your Collection Preservation Environment

- Air Conditioning Basics
- Elements of Environmental Control
- Role of Owner's Representatives
- Funding a Facilities Upgrade
- Grants, Rebates and Talking-Points
- Question & Answer
- Contacts and Other Resources

Air Conditioning Basics

Map Reading

WHERE ARE YOU?

- Take measurements
- Plot trends



WHERE TO YOU WANT TO BE?

- What do you need controlled?
 - Temperature?
 - Humidity?
 - Contaminants?
 - Light?
- What are the acceptable limits for each property to be controlled?

HOW DO YOU GET THERE?

- See how far you are from where you want to be
- Decide what needs to be changed
- Get the help you need

Where are you?

- Take measurements

Monitor the values of each property you wish controlled

Indoors

Outdoors

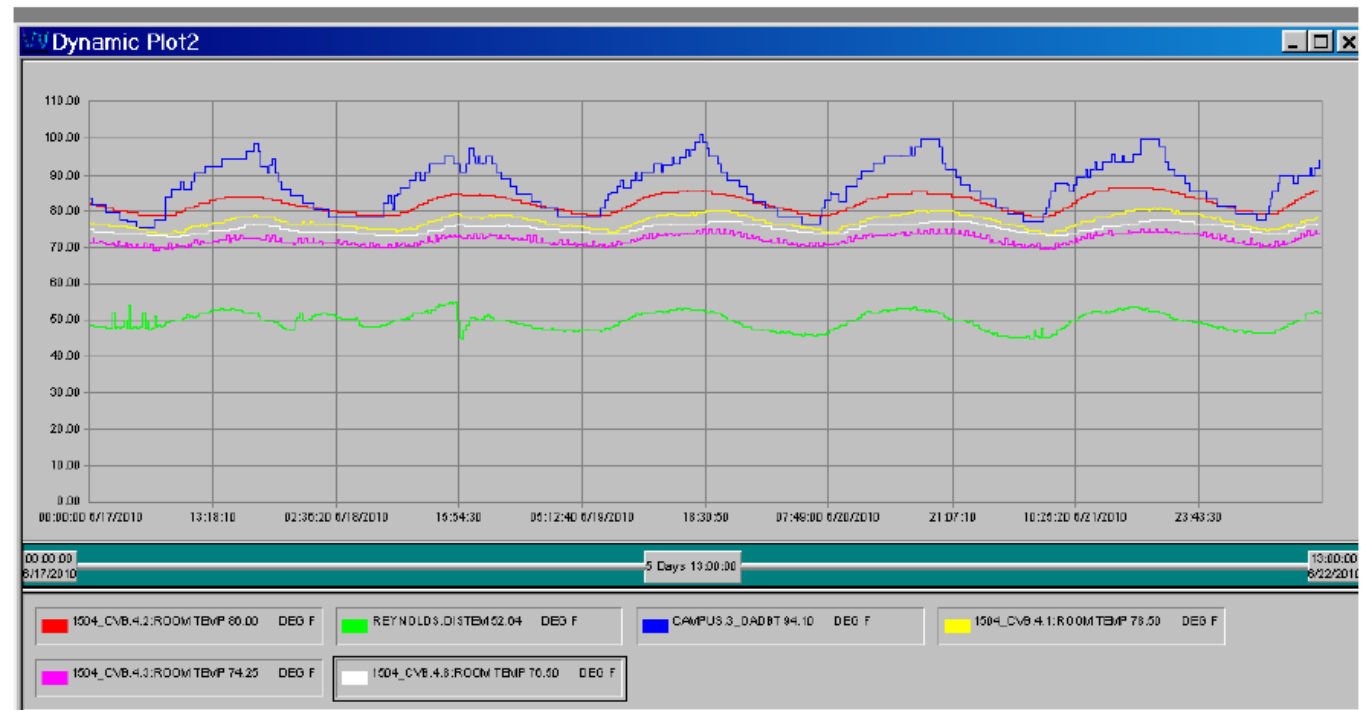
You can use outdoor data obtained and compiled by others

Local airport or weather station

NOAA

- Plot trends

Graphs help with visualizing the data



Blue = Outside Air Temp. / Red = Room 420C / Yellow = 420D / Magenta = 420 B / White = Room 420A / Green = AHU Discharge Temp.

Where do you want to be?

- What do you need controlled?
 - Temperature?
 - Humidity?
 - Contaminants?
 - Light?
- What are the acceptable limits for each property to be controlled?
 - Each property needs a defined upper limit and a defined lower limit.
 - Set points for most collection environments:
 - 70° F +/- 2°
 - 50% RH +/- 5%
 - A bit cooler and drier is often preferred

How to get to where you want to be

- See how far you are from where you want to be
 - Compare where you are with where you want to be
 - Temperature
 - Humidity
 - Contamination
 - Lighting
- Let's talk about Environmental Control

Environmental Control

Separation

The first step of controlling an environment is to separate the controlled environment from the uncontrolled environment.

- Reduce infiltration (think submarine)
- Slow heat transfer (insulation)
- Limit solar radiation (opaque surfaces)



Trying to modify the controlled environment without separating it from the uncontrolled environment results in a lot of wasted effort.

Separating the controlled environment from the uncontrolled environment is largely the domain of architects.

Environmental Control

TEMPERATURE

- Cooling
- Heating

HUMIDITY

- Dehumidifying
- Humidifying

CONTAMINATION

- Filtration

LIGHTING



Controlling Contamination

- Filters can remove particulate matter and some chemical fumes
 - MERV rating tells the size range of particles removed
 - MERV 1 – 4: large particle dirt and debris
 - MERV 5 – 8: average dust, pollen, mold spores
 - MERV 9 – 12: fine dust, soot, some bacteria
 - MERV 13 – 16: bacteria, smoke, some virus
 - For finer filtration than MERV 16 use HEPA or ULPA filters
 - For chemical fumes like hydrogen sulfide, filters with absorptive materials such as activated charcoal can be used

Note: Finer filtration generally requires more fan power

Temperature

- Dry bulb
 - Dry bulb temperature is usually just called temperature. It's what you read right off a thermometer.
- Dew-point
 - Dew-point is the temperature at which water would start condensing out of the given sample of moist air.



Humidity

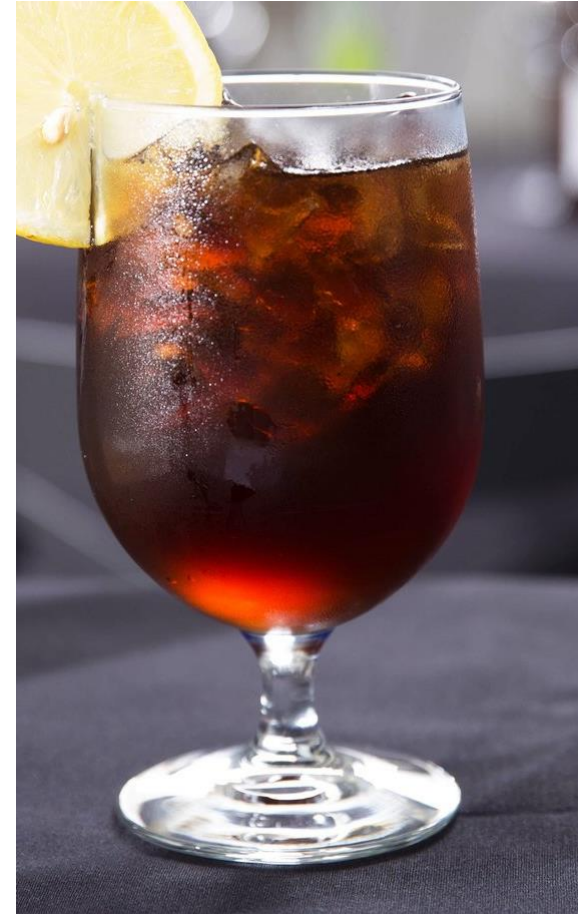
An expression of the amount of water vapor in the air

- Humidity Ratio
 - Mass Ratio (pounds of water per pound of dry air)
- Relative Humidity
 - Expression of saturation based on partial vapor pressures of water
Partial vapor pressure moves moisture
- Saturation

The condition of an air sample containing all the water vapor that it can.

Humidity Ratio - Dew-Point

- Humidity ratio is the mass ratio of water to dry air
When using the same units for the water and air it is just a number.
It is also customary to use grains of water per pound of dry air.
- Dew-point as the temperature at which water begins to condense out of the air relates directly to humidity ratio. So if you know the dew-point you can also know the humidity ratio.



Relative Humidity

- Expression of saturation based on partial vapor pressures of water
Partial vapor pressure moves moisture like elevation moves water
- Air's capacity to hold moisture varies with temperature and pressure

The pressure differences in most air conditioning systems are not enough to have much impact on the air's capacity to hold moisture.

However, the temperature differences have a very big impact on the air's capacity to hold moisture.

Air's capacity to hold moisture increases with temperature.

Warm air can hold more moisture than cold air.

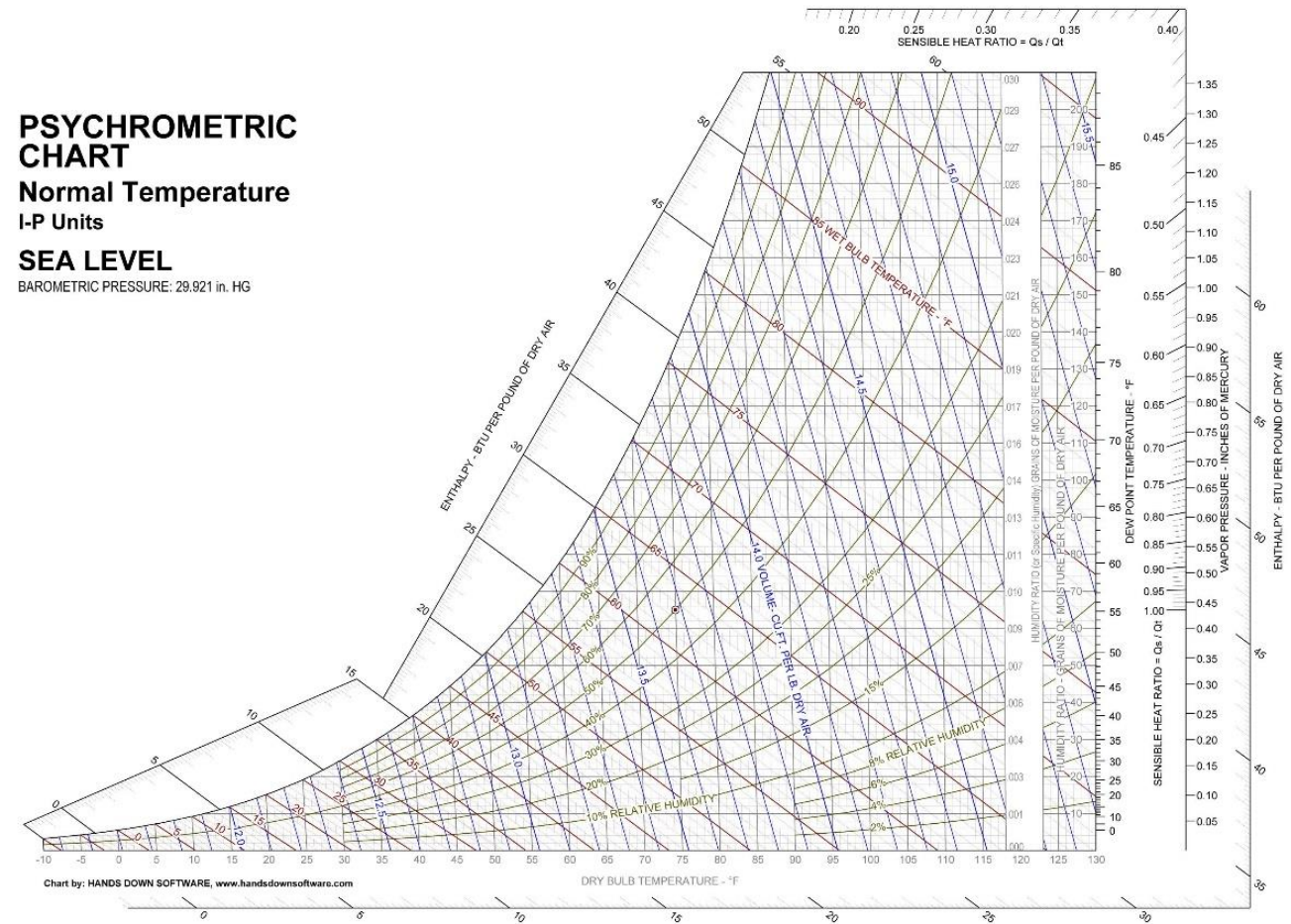
Heating

When air is heated the relative humidity decreases even if the amount of moisture in the air stays the same. This is because the capacity of the air to hold moisture increases. So the air feels drier and can possibly draw moisture out of materials.

Clothes dryers work by heating air, without doing anything else about its moisture content, to drop the relative humidity of that air so the air can draw the moisture out of the damp clothes.

Relation of Moist Air Properties

- In general, if you know any two properties of a moist air sample, you can find all the other properties either by looking on a psychrometric chart or with a psychrometric property app.
- For air conditioning design, it helps understanding the process to express the desired room condition in terms of temperature and dew-point.



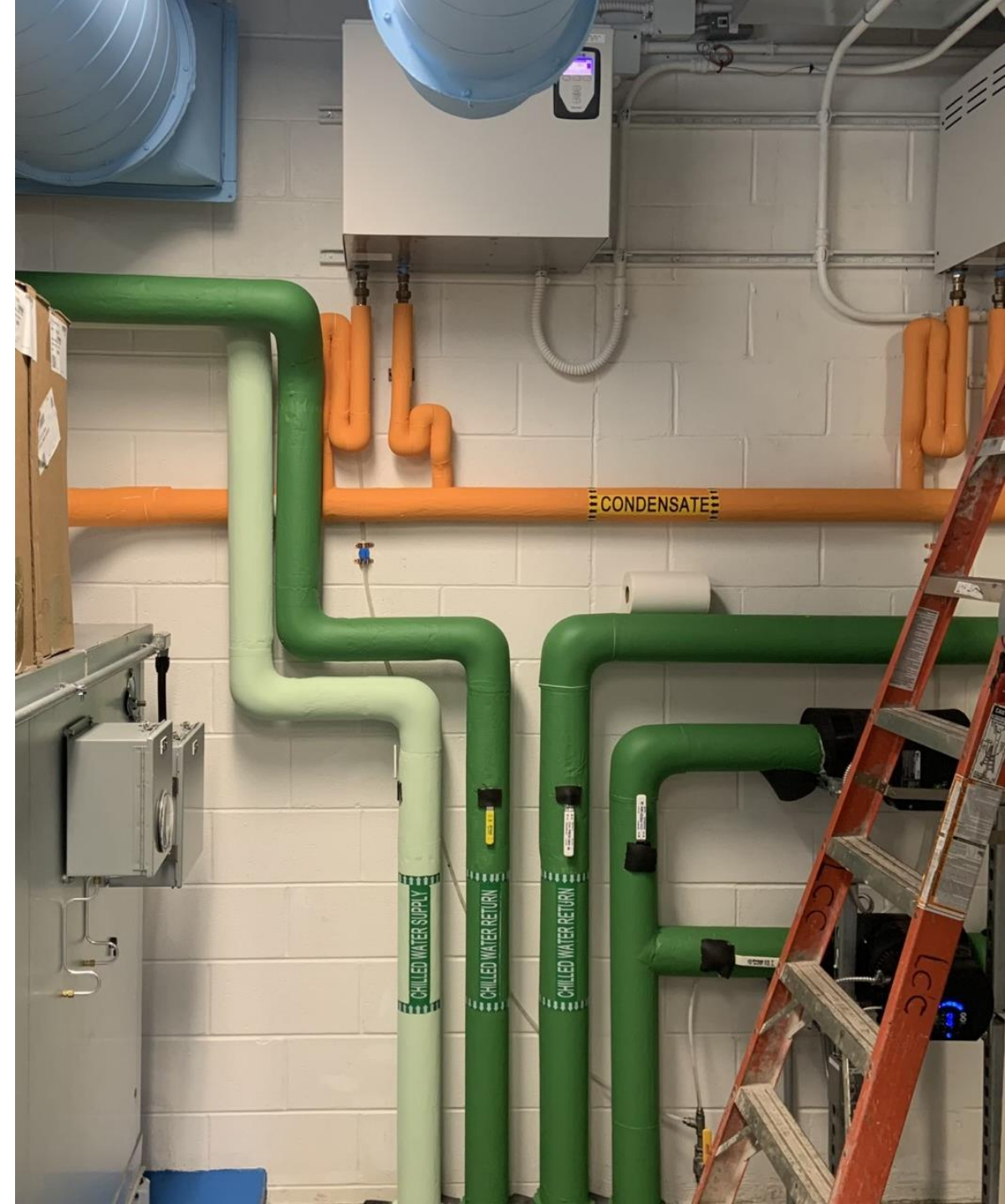
Cooling

When air is cooled the relative humidity increases even if the amount of moisture in the air stays the same. If the air is cooled to or below its dew-point, moisture will be condensed out of the air. This is because the capacity of the air to hold moisture decreases. So the air feels wetter, and materials can possibly draw moisture out of the cooled air.

If the surfaces cooling the air are significantly below the air's dew-point, moisture can be condensed out of the air without cooling the air to its dew-point. Think of a glass of iced tea on a hot and humid day.

Humidification

- Humidifiers add water to the air
 - Spray a fine mist into the air stream
 - Inject or evaporate water vapor into the air stream



Dehumidification

- Cooling: As discussed earlier, dehumidification is a normal byproduct of cooling. Dehumidification by cooling is limited by the potential for freezing and the formation of frost.
 - If the cooling medium is chilled water, antifreeze compounds can be added to operate at lower than normal temperatures (42° F).
 - All cooling media operating near freezing (32° F) are susceptible to frost build up on the air side of the cooling surfaces. While draining water is usually fairly easy, removing frost presents more difficulties.
- Desiccants: Desiccants are substances which draw moisture directly out of the air.

Expressing Desired Conditions

- It is helpful to express the desired room condition in terms of temperature and dew-point.
- Knowing the desired dew-point clues you into what methods of dehumidification will be effective.
 - 52° F or higher, most common cooling methods will be fine
 - 48° F to 51° F, some DX (direct exchange), and chilled water systems
 - 42° F to 47° F, chilled water with anti-freeze, usually glycol systems
 - Below 42° F, desiccant systems

Getting to where you want to be

- What will it take to achieve your desired conditions?
 - **SEPARATION**
Separate the controlled environment from the uncontrolled environment
 - **TEMPERATURE**
Cooler temperatures makes the air feel more humid
 - **HUMIDITY**
Expressing desired humidity as a dew-point identifies probable humidity control methods
 - **CONTAMINATION**
More filtration usually requires more fan power
 - **LIGHTING**
See a lighting specialist or electrical engineer

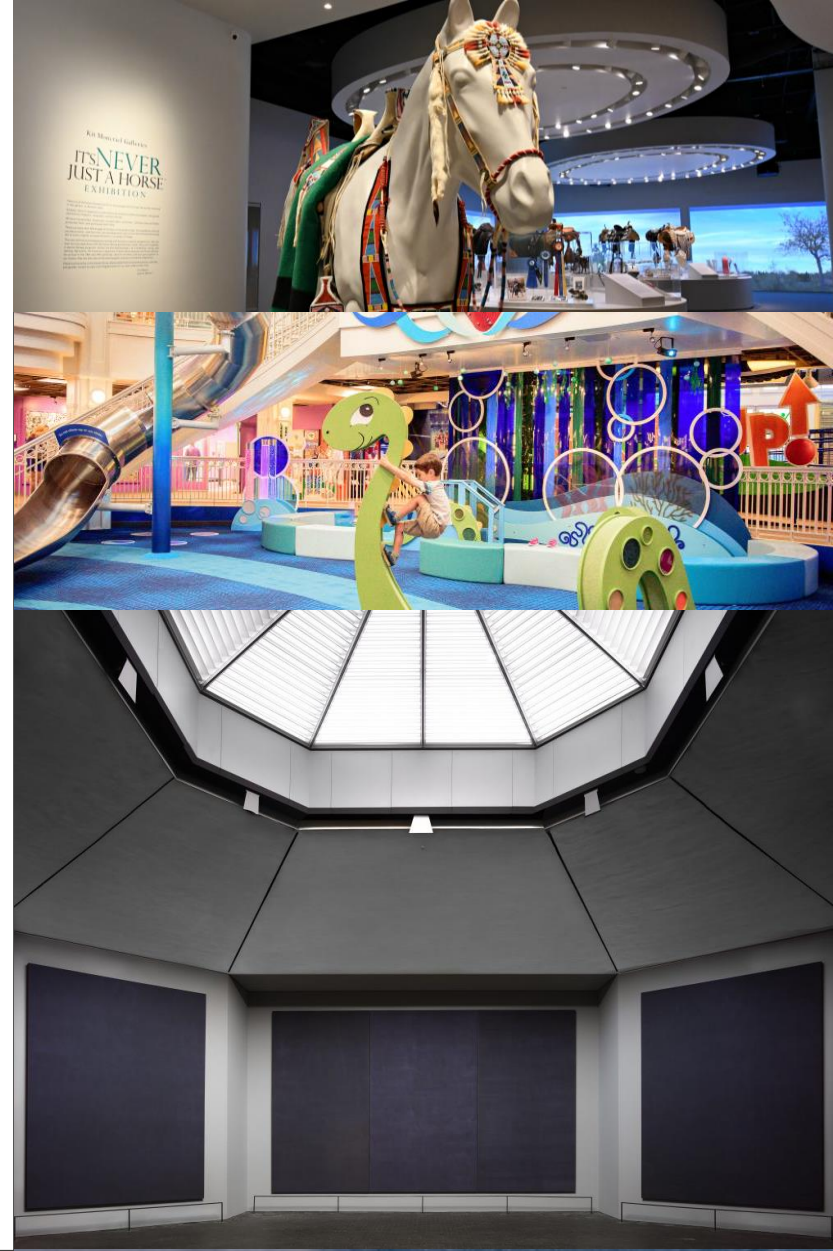
The role of an Owner's Representative

- “What would you say you do here?”



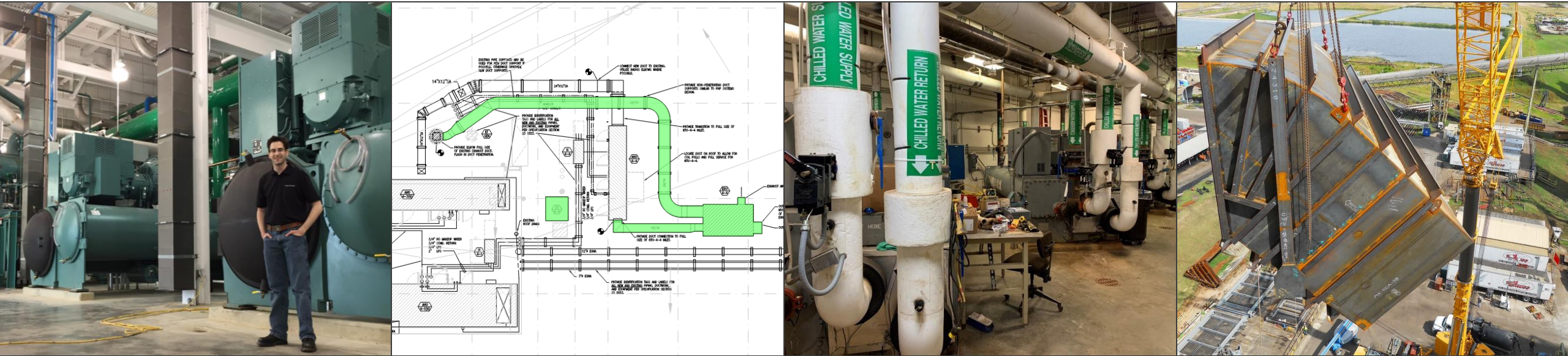
Introduction

- Who are Owner's Representatives?
- What do we do?



Who are Owner's Representatives?

- Come from all kinds of backgrounds
- Firms that do this work can be technical in nature or not



Who are Owner's Representatives?

- May specialize in particular project types
- For example, The Projects Group has delivered over 20 years and \$600M in museums, including:

Abilene Heritage Square
American Quarter Horse Museum
Amon Carter Museum
Botanical Research Institute of
Texas
Cattle Raisers Museum
Ellen Noel Art Museum
Fort Worth Museum of Science
and History
Fred Rouse Center
Longview Museum of Fine Arts

Museum of Fine Arts, Houston
Museum of Living Art
National Cowgirl Museum
New Britain Museum of
American Art
Rothko Chapel
San Antonio Museum of Art
Sid Richardson Museum
Discovery Children's Museum
The DoSeum
The Saban Center



What do Owner's Representatives do?

- Whatever you need!
- Third-party advocate to speak this language and pitch your needs
- Generate comfort within design and construction teams for higher quality, better team structure, and improved costs
- Provide strategic or day-to-day guidance on all kinds of projects, small or large
- Procure and lead project team



Building an MEP team

- Have systems as sophisticated as designable, constructible, and serviceable in your area
- When designing needs, know your specific issues – and make sure the team you select has experience with solving those issues
- Be (relatively) geographically agnostic while selecting a design team

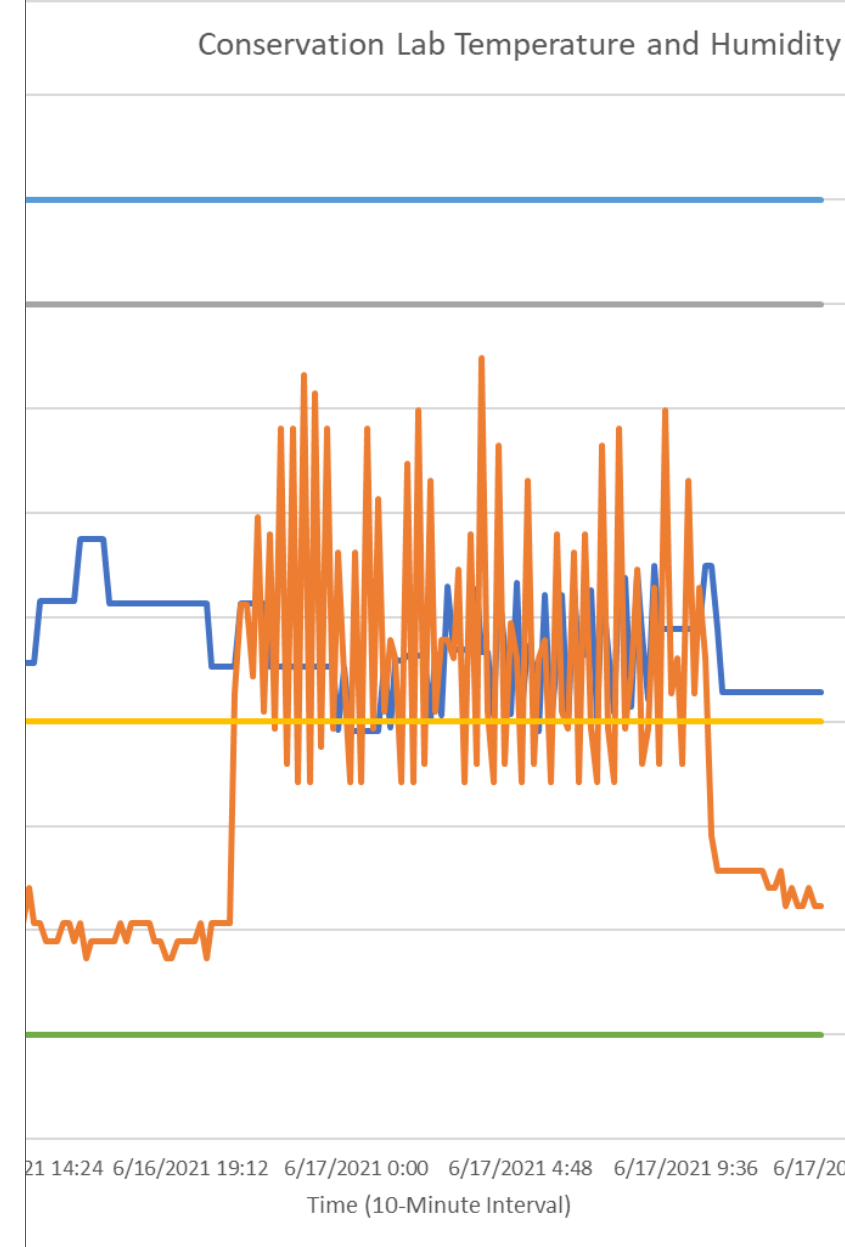


How to fund facility upgrades



Know your audience

- Be detailed to show an understanding of the issue
- Don't be too detailed and lose less-quantitative stakeholders
- Get feedback from stakeholders of what works and what doesn't



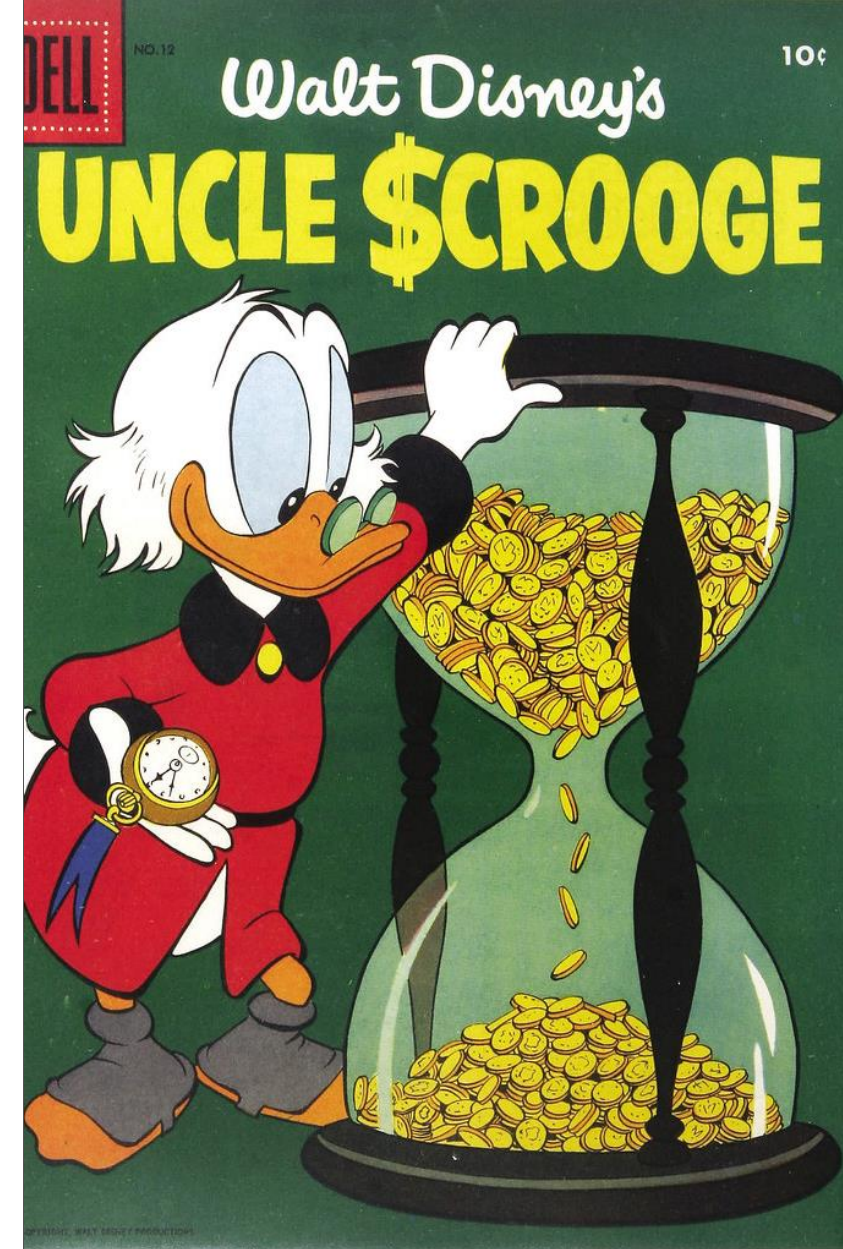
Bring a wingman

- Build and bring a team when seeking these funds
- Validates the plan, needs, and delivery
- Have all departments represented in the request, if possible



Be rich!

- Use seed money from endowment and pay it back with savings – and with interest



Be diligent

- Invest in good projects
 - Have systems as sophisticated as designable, constructible, and serviceable as your area
- Allocate a minimum of 2 percent of annual budget to long-term facilities planning



What if we don't do it?

- Collection damage
- Lose opportunity for loans
- Close facility to visitors and/or fellows



Felipe Milanez, Fire at the National Museum of Brazil



NYPD, stolen tabernacle from St. Augustine Cathedral



Oaklee's, DuPage Children's Museum flood



manhhai, The devastating Notre Dame Cathedral fire

Profit center

- Positive (relative to business as usual) LCC projects will develop from proper planning
- Use these savings to bankroll future projects
- Create a facilities slush fund
- Some projects may payback in one year, avoid need for CapEx (fund out of OpEx)
- Delayed savings are lost savings
- Use reduced insurance premia to fund projects
- “We don’t have the money”
 - None of these institutions are going away
 - Protecting the collection costs money regardless
 - Some short- and long-term costs are avoidable



Grants & Rebates – Part I

- Local / state / federal government
 - COVID-related
 - ARPA / ESSER
 - Employee Retention Credit
 - Better Buildings Initiative
 - City/county sustainability goals and bonds
 - Institute of Museum and Library Services (IMLS)
 - National Endowment for the Humanities (NEH) Infrastructure and Capacity Building Challenge Grants
 - National Endowment for the Arts (NEA)
 - National Center for Preservation Technology and Training (NCPTT)
 - National Historical Publications and Records Commission (NHPRC)
 - National Science Foundation (NSF)
 - State Humanities Councils
 - Property Assessed Clean Energy (PACE)
 - LoanSTAR Revolving Loan Program by SECO



Grants & Rebates – Part II

- Foundations
 - American Alliance of Museums
 - Frankenthaler Climate Initiative
 - The Andrew W. Mellon Foundation
 - The Ford Foundation
 - The Foundation of the American Institute for Conservation of Historic and Artistic Works (FAIC)
 - The Getty Grant Program
 - The Grammy Foundation Grant Program
 - Local economic-development council
 - Local culture / arts foundations
- Historic Preservation / New Markets Tax Credits
- Utilities
- Manufacturers / vendors



Bundling

- Bundle infrastructure projects with another trigger, like capacity building
- Use excitement generated by new acquisition
- Try to resolve pressure points/issues in conjunction with a project that might bring savings (switching from pneumatic to DDS, for example)
- Doom-and-gloom might require money – and a donor might want to put extra toward something flashy, too
- Get stakeholder confidence over time



Demonstrate due diligence

- Build long-term confidence in the plan and add credibility
- Clear set of projects to be done at specific times and at a particular cost
- Firming up and optimizing OpEx and CapEx projections
- Risk management
- Better ability to tell museum's story to donors by learning more about it
- Perform an Infrastructure Master Plan (IMP)

Rationale	Fiscal Year	Estimated Project Cost		2022	
End of Useful Life	2024	\$	1,638,939.67		
Capacity	2022	\$	425,625.59	\$ 425,625.59	
Capacity					
Capacity	2022	\$	79,360.26	\$ 79,360.26	
Amenity	2025	\$	877,575.00		
End of Useful Life	2023	\$	286,280.00		\$ 304,0
Capacity	2025	\$	1,400,000.00		
End of Useful Life	2024	\$	1,723,189.00		
Capacity	2023	\$	353,849.15		\$ 376,0
End of Useful Life	2026	\$	1,050,000.00		
End of Useful Life	2026	\$	650,000.00		
End of Useful Life	2026	\$	475,000.00		
End of Useful Life	2026	\$	400,000.00		
		Annual Total		\$ 504,985.84	\$ 680,0
Circuit	Station/Circuit Name	Out Date	Duration Minutes	Major Cause Category	Cause
965540	LONGVIEW	7/30/2019	226	Distribution Line	TREE INSIDE ROW
965540	LONGVIEW	8/18/2019	59	Transmission Line	LOAD SHED
965540	LONGVIEW	9/12/2019	100	Distribution Station	WEATHER - LIGHTNING
964090	WHITNEY	10/24/2019	46	Distribution Line	TREE INSIDE ROW
965540	LONGVIEW	3/30/2020	110	Transmission Line	WEATHER - LIGHTNING
964090	WHITNEY	4/12/2020	2831	Distribution Line	WEATHER - LIGHTNING
964090	WHITNEY	5/7/2020	36	Distribution Line	WEATHER - LIGHTNING
964090	WHITNEY	5/7/2020	37	Distribution Line	TREE OUT OF ROW
964090	WHITNEY	5/24/2020	380	Distribution Line	WEATHER - LIGHTNING
964090	WHITNEY	5/25/2020	14	Distribution Line	SCHEDULED COMPANY
965540	LONGVIEW	8/16/2020	18	Distribution Line	ABNORMAL FEED
964090	WHITNEY	11/1/2020	13	Distribution Line	TREE INSIDE ROW
Equipment Item	Median Years	Equipment Item	Median Years		
Air terminals		Air-cooled condensers	20		
Diffusers, grilles, and registers	27	Evaporative condensers	20		
Induction and fan coil units	20	Insulation			
VAV and double-duct boxes	20	Molded Blanket	20		
Air washers	17		24		
Ductwork	30	Pumps			
Dampers	20	Base-mounted	20		
Fans		Pipe-mounted	10		

Fear of Missing Out (FOMO)

- Projects at peer institutions
- Benchmarking data
- Risk of losing loans / visitors / donations / acquisitions
- Use this mentality with all stakeholders – staff, board, donors, local foundations, local government, etc.



Puffery

- Call these projects anything other than “Infrastructure Projects,” such as:
 - “Preservation projects”
 - “Access projects”
 - “Visitor experience improvement projects”
 - “Capacity-building projects”
 - “Community-engagement projects”



Hire a fundraising consultant

- There are experts at this sort of thing – use them!
- Funding methods

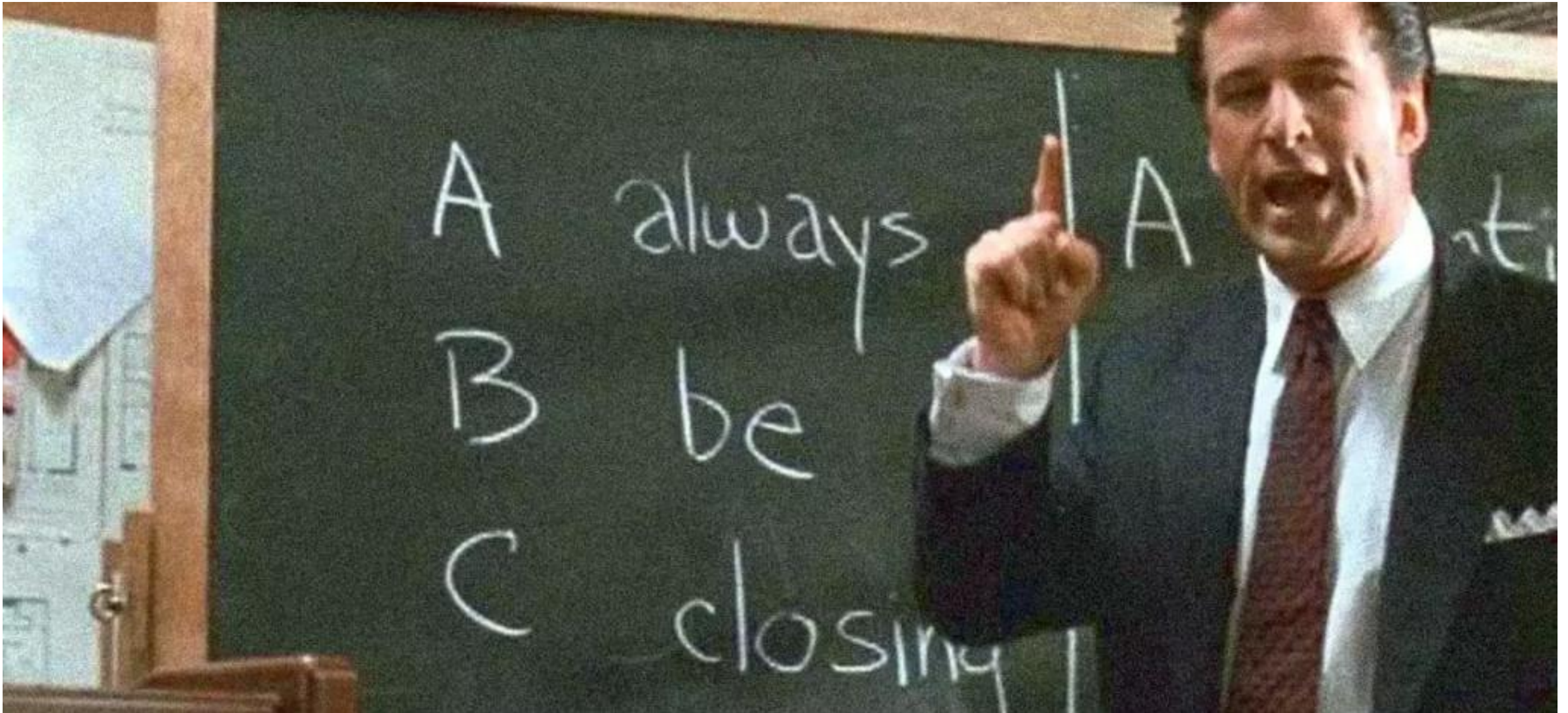


Build & use your board

- Boards exist for strategic, curatorial reasons – but also for a financial reason
- Make sure your board includes advocates for facilities systems
 - Do this organically (by training them) or proactively (by adding like-minded board members)
- Bring your board members to meetings with local funding partners to promote grant-giving
- Provide access to collections-storage or lab environments (if appropriate)



Always be closing



Glengarry Glen Ross

Sources and References

schwartzsilver



ARUP



museumINSIGHTS

BURNS MCDONNELL

Museum Planner
A blog of museum planning by an experienced museum planner



BURO HAPPOLD

DLR Group Westlake
Reed
Leskosky



American
Alliance of
Museums



ARMSTRONG



Contacts and Other Resources

Jimmy Hensel, PE, Chief Mechanical Engineer, SSC Services for Education

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John Stevenson, PE, Executive Vice President, The Projects Group

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Psychrometric calculator: <http://people.tamu.edu/~i-choudhury/psych.html>

Dew point calculator: <http://www.dpcalc.org/>

Texas Collections Emergency Resource Alliance: <http://txcera.org>

